



ENERGY AUDIT – FINAL REPORT

02/12/2010

BOROUGH OF COLLINGSWOOD WATER TREATMENT PLANT

215 HILLCREST AVENUE

COLLINGSWOOD, NJ 08108

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ADMINISTRATOR**

CEG PROJECT No. 9C09083

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Table of Contents

I.	EXECUTIVE SUMMARY	3
II.	INTRODUCTION	7
III.	METHOD OF ANALYSIS.....	8
IV.	HISTORIC ENERGY CONSUMPTION/COST	10
A.	ENERGY USAGE / TARIFFS	10
B.	ENERGY USE INDEX (EUI).....	13
C.	EPA ENERGY BENCHMARKING SYSTEM.....	17
V.	FACILITY DESCRIPTION	18
VI.	MAJOR EQUIPMENT LIST	19
VII.	ENERGY CONSERVATION MEASURES.....	20
VIII.	RENEWABLE/DISTRIBUTED ENERGY MEASURES	22
IX.	ENERGY PURCHASING AND PROCUREMENT STRATEGY	25
X.	INSTALLATION FUNDING OPTIONS.....	28
XI.	ADDITIONAL RECOMMENDATIONS	29

Appendix A – ECM Cost & Savings Breakdown

Appendix B – New Jersey Smart Start® Program Incentives

Appendix C – Portfolio Manager “Statement of Energy Performance”

Appendix D – Major Equipment List

Appendix E – Investment Grade Lighting Audit

Appendix F – Renewable / Distributed Energy Measures Calculations

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I. EXECUTIVE SUMMARY

This report presents the findings of the energy audit conducted for:

Borough of Collingswood
678 Haddon Avenue
Collingswood, NJ 08108

Municipal Contact Person: Bradford C. Stokes, Administrator

This audit is performed in connection with the New Jersey Clean Energy - Local Government Energy Audit Program. The energy audit is conducted to promote the mission of the office of Clean Energy, which is to use innovation and technology to solve energy and environmental problems in a way that improves the State's economy. This can be achieved through the wiser and more efficient use of energy.

The annual energy costs at this facility are as follows:

Electricity	\$ 155,544
Fuel Oil	\$2,081
<hr/>	
Total	\$ 157,625

The potential annual energy cost savings for each energy conservation measure (ECM) and renewable energy measure (REM) are shown below in Table 1. Be aware that the ECM's and REM's are not additive because of the interrelation of some of the measures. This audit is consistent with an ASHRAE level 2 audit. The cost and savings for each measure is $\pm 20\%$. The evaluations are based on engineering estimations and industry standard calculation methods. More detailed analyses would require engineering simulation models, hard equipment specifications, and contractor bid pricing.

Table 1
Financial Summary Table

ENERGY CONSERVATION MEASURES (ECM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST^A	ANNUAL SAVINGS^B	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
ECM #1	Lighting Upgrade - General	\$1,450	\$714	2.0	566.2%
RENEWABLE ENERGY MEASURES (REM's)					
ECM NO.	DESCRIPTION	NET INSTALLATION COST	ANNUAL SAVINGS	SIMPLE PAYBACK (Yrs)	SIMPLE LIFETIME ROI
REM #1	Photovoltaic System	\$457,470	\$40,375	11.3	120.6%

Notes: A. Cost takes into consideration applicable NJ Smart StartTM incentives.
 B. Savings takes into consideration applicable maintenance savings.

The estimated demand and energy savings for each ECM and REM is shown below in Table 2.
 The descriptions in this table correspond to the ECM's and REM's listed in Table 1.

Table 2
Estimated Energy Savings Summary Table

ENERGY CONSERVATION MEASURES (ECM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	FUEL OIL (GALLONS)
ECM #1	Lighting Upgrade - General	4.3	4471.0	N/A
RENEWABLE ENERGY MEASURES (REM's)				
ECM NO.	DESCRIPTION	ANNUAL UTILITY REDUCTION		
		ELECTRIC DEMAND (KW)	ELECTRIC CONSUMPTION (KWH)	FUEL OIL (GALLONS)
REM #1	Photovoltaic System	50.8	79323	N/A

Concord Engineering Group (CEG) recommends proceeding with the implementation of all ECM's that provide a calculated simple payback at or under ten (10) years. Although the Photovoltaic system payback is over 10 years, it is still recommended since the site is acceptable due the flat roof, societal benefits and as insurance against volatile fossil fuel energy markets. The following Energy Conservation Measures are recommended for the facility:

- **ECM #1: Lighting Upgrade**
- **REM #1: Photovoltaic System**

The largest energy user at this facility is the process pumps. CEG notes that these pumps have already been retrofitted with variable frequency drives, with efficient motors to match the drives. As such, opportunities for an ECM regarding pump efficiency are not available.

In addition to the ECMs, there are maintenance and operational measures that can provide significant energy savings and provide immediate benefit. The ECMs listed above represent investments that can be made to the facility which are justified by the savings seen overtime. However, the maintenance items and small operational improvements below are typically achievable with on site staff or maintenance contractors and in turn have the potential to provide substantial operational savings compared to the costs associated. The following are recommendations which should be considered a priority in achieving an energy efficient building:

1. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
2. Maintain all weather stripping on entrance doors.
3. Clean all light fixtures to maximize light output.
4. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

II. INTRODUCTION

The comprehensive energy audit covers the Borough of Collingswood's Water Treatment Plant located at 215 Hillcrest Ave. in Collingswood. The facility is a full water treatment and distribution operation.

Electrical and natural gas utility information is collected and analyzed for one full year's energy use of the building. The utility information allows for analysis of the building's operational characteristics; calculate energy benchmarks for comparison to industry averages, estimated savings potential, and baseline usage/cost to monitor the effectiveness of implemented measures. A computer spreadsheet is used to calculate benchmarks and to graph utility information (see the utility profiles below).

The Energy Use Index (EUI) is established for the building. Energy Use Index (EUI) is expressed in British Thermal Units/square foot/year (BTU/ft²/yr), which is used to compare energy consumption to similar building types or to track consumption from year to year in the same building. The EUI is calculated by converting the annual consumption of all energy sources to BTU's and dividing by the area (gross square footage) of the building. Blueprints (where available) are utilized to verify the gross area of the facility. The EUI is a good indicator of the relative potential for energy savings. A low EUI indicates less potential for energy savings, while a high EUI indicates poor building performance therefore a high potential for energy savings.

Existing building architectural and engineering drawings (where available) are utilized for additional background information. The building envelope, lighting systems, HVAC equipment, and controls information gathered from building drawings allow for a more accurate and detailed review of the building. The information is compared to the energy usage profiles developed from utility data. Through the review of the architectural and engineering drawings a building profile can be defined that documents building age, type, usage, major energy consuming equipment or systems, etc.

The preliminary audit information is gathered in preparation for the site survey. The site survey provides critical information in deciphering where energy is spent and opportunities exist within a facility. The entire site is surveyed to inventory the following to gain an understanding of how each facility operates:

- Building envelope (roof, windows, etc.)
- Heating, ventilation, and air conditioning equipment (HVAC)
- Lighting systems and controls
- Facility-specific equipment

The building site visit is performed to survey all major building components and systems. The site visit includes detailed inspection of energy consuming components. Summary of building occupancy schedules, operating and maintenance practices, and energy management programs provided by the building manager are collected along with the system and components to determine a more accurate impact on energy consumption.

III. METHOD OF ANALYSIS

Post site visit work includes evaluation of the information gathered, researching possible conservation opportunities, organizing the audit into a comprehensive report, and making recommendations on HVAC, lighting and building envelope improvements. Data collected is processed using energy engineering calculations to anticipate energy usage for each of the proposed energy conservation measures (ECMs). The actual building's energy usage is entered directly from the utility bills provided by the owner. The anticipated energy usage is compared to the historical data to determine energy savings for the proposed ECMs.

It is pertinent to note, that the savings noted in this report are not additive. The savings for each recommendation is calculated as standalone energy conservation measures. Implementation of more than one ECM may in some cases affect the savings of each ECM. The savings may in some cases be relatively higher if an individual ECM is implemented in lieu of multiple recommended ECMs. For example implementing reduced operating schedules for inefficient lighting will result in a greater relative savings. Implementing reduced operating schedules for newly installed efficient lighting will result in a lower relative savings, because there is less energy to be saved. If multiple ECM's are recommended to be implemented, the combined savings is calculated and identified appropriately.

ECMs are determined by identifying the building's unique properties and deciphering the most beneficial energy saving measures available that meet the specific needs of the facility. The building construction type, function, operational schedule, existing conditions, and foreseen future plans are critical in the evaluation and final recommendations. Energy savings are calculated base on industry standard methods and engineering estimations. Energy consumption is calculated based on manufacturer's cataloged information when new equipment is proposed.

Cost savings are calculated based on the actual historical energy costs for the facility. Installation costs include labor and equipment costs to estimate the full up-front investment required to implement a change. Costs are derived from Means Cost Data, industry publications, and local contractors and equipment suppliers. The NJ Smart Start Building® program incentives savings (where applicable) are included for the appropriate ECM's and subtracted from the installed cost. Maintenance savings are calculated where applicable and added to the energy savings for each ECM. The life-time for each ECM is estimated based on the typical life of the equipment being replaced or altered. The costs and savings are applied and a simple payback, simple lifetime savings, and simple return on investment are calculated. See below for calculation methods:

ECM Calculation Equations:

$$\text{Simple Payback} = \left(\frac{\text{Net Cost}}{\text{Yearly Savings}} \right)$$

$$\text{Simple Lifetime Savings} = (\text{Yearly Savings} \times \text{ECM Lifetime})$$

$$\text{Simple Lifetime ROI} = \frac{(\text{Simple Lifetime Savings} - \text{Net Cost})}{\text{Net Cost}}$$

$$\text{Lifetime Maintenance Savings} = (\text{Yearly Maintenance Savings} \times \text{ECM Lifetime})$$

$$\text{Internal Rate of Return} = \sum_{n=0}^N \left(\frac{\text{Cash Flow of Period}}{(1 + \text{IRR})^n} \right)$$

$$\text{Net Present Value} = \sum_{n=0}^N \left(\frac{\text{Cash Flow of Period}}{(1 + \text{DR})^n} \right)$$

Net Present Value calculations based on Interest Rate of 3%.

IV. HISTORIC ENERGY CONSUMPTION/COST

A. Energy Usage / Tariffs

The energy usage for the facility has been tabulated and plotted in graph form as depicted within this section. Each energy source has been identified and monthly consumption and cost noted per the information provided by the Owner.

The electric usage profile represents the actual electrical usage for the facility. Atlantic City Electric (ACE) provides electricity to the facility under their Annual General Service rate structure. The electric utility measures consumption in kilowatt-hours (KWH) and maximum demand in kilowatts (KW). One KWH usage is equivalent to 1000 watts running for one hour. One KW of electric demand is equivalent to 1000 watts running at any given time. The basic usage charges are shown as generation service and delivery charges along with several non-utility generation charges. Rates used in this report reflect the historical data received for the facility.

The overall cost for utilities is calculated by dividing the total cost by the total usage. Based on the utility history provided, the average cost for utilities at this facility is as follows:

<u>Description</u>	<u>Average</u>
Electricity	13.5¢ / kWh
Natural Gas	No Service
Fuel Oil	\$2.81 / gal.

Table 3
Electricity Billing Data

ELECTRIC USAGE SUMMARY			
Utility Provider: PSE & G Rate: Annual general Meter No: 778001961 Customer ID No: 61 472 953 22 Third Party Utility Pepco Energy TPS Meter / Acct No: 103-5006347			
MONTH OF USE	CONSUMPTION KWH	DEMAND	TOTAL BILL
Jan-08	87,220	194.0	\$11,064
Feb-08	91,586	186.5	\$11,578
Mar-08	80,050	208.1	\$10,237
Apr-08	81,196	178.6	\$10,327
May-08	84,550	227.5	\$10,804
Jun-08	113,967	295.9	\$16,973
Jul-08	125,847	328.3	\$18,740
Aug-08	122,986	313.9	\$18,207
Sep-08	103,886	321.5	\$16,054
Oct-08	74,908	270.4	\$9,763
Nov-08	92,774	263.9	\$11,959
Dec-08	74,115	263.9	\$9,838
Totals	1,133,085	328.3 Max	\$155,544
AVERAGE DEMAND 254.4 KW average AVERAGE RATE \$0.137 \$/kWh			

Figure 1
Electricity Usage Profile

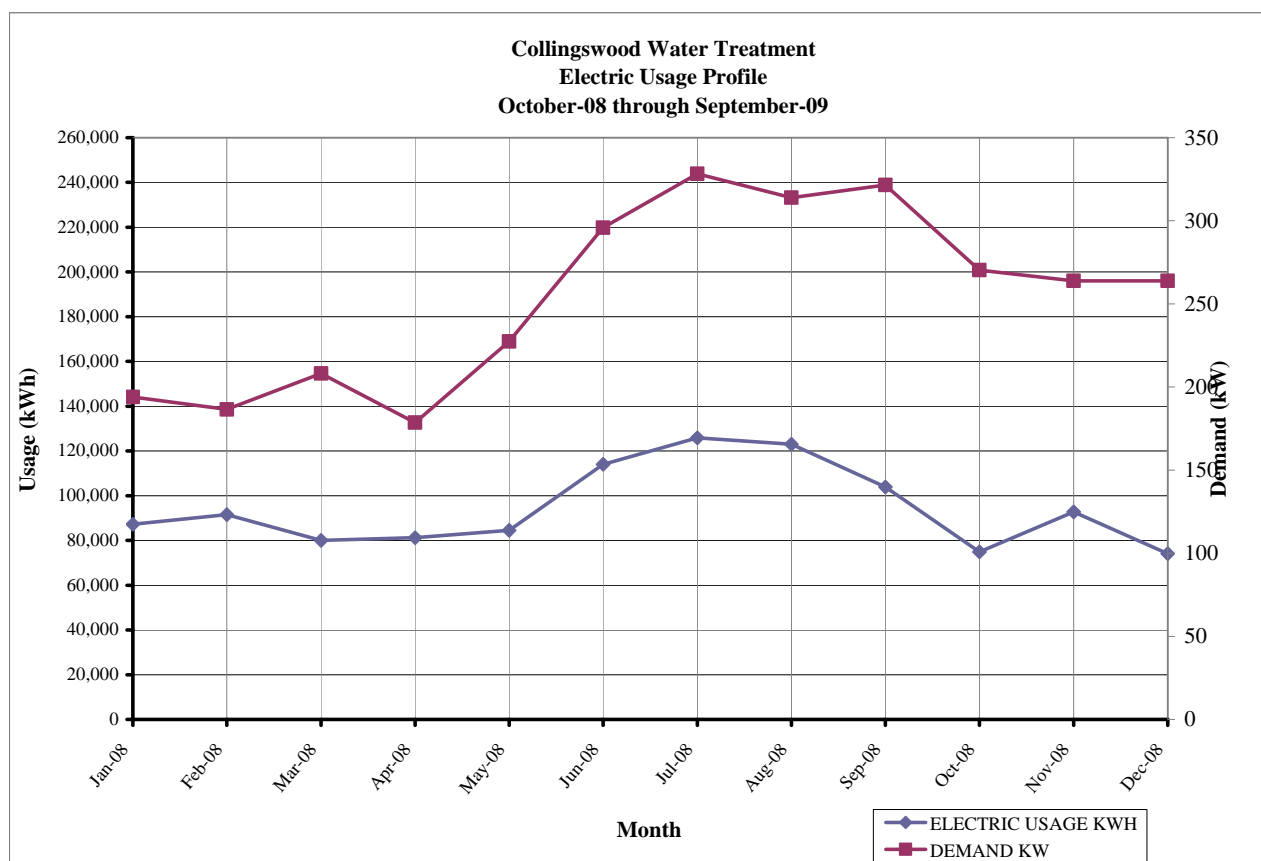
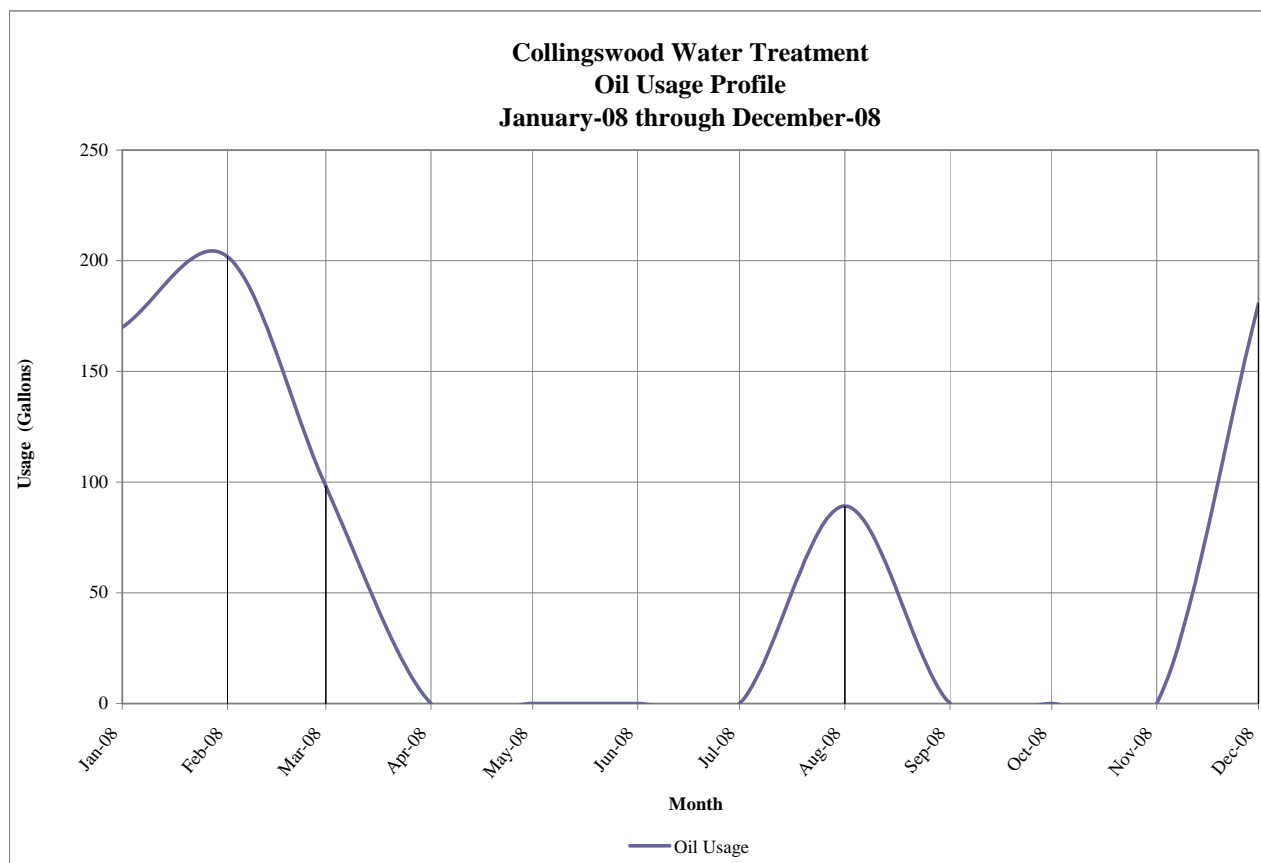


Table 4
Fuel Oil Billing Data

FUEL OIL USAGE SUMMARY		
Utility Provider: Majestic Oil Company, Inc. Rate: General Service gas Account No: 2061 Point of Delivery ID: n/a Third Party Utility Provider: n/a TPS Meter No: n/a		
MONTH OF USE	CONSUMPTION (Gallons)	TOTAL BILL
Jan-08	169.90	\$467.89
Feb-08	201.90	\$609.68
Mar-08	98.20	\$336.01
Apr-08	0.00	\$0.00
May-08	0.00	\$0.00
Jun-08	0.00	\$0.00
Jul-08	0.00	\$0.00
Aug-08	89.20	\$341.01
Sep-08	0.00	\$0.00
Oct-08	0.00	\$0.00
Nov-08	0.00	\$0.00
Dec-08	180.70	\$327.01
TOTALS	739.90	\$2,081.60
AVERAGE RATE:	\$2.81	\$/Gallon

Figure 2
Fuel Oil Usage Profile



Energy Use Index (EUI)

Energy Use Index (EUI) is a measure of a building's annual energy utilization per square foot of building. This calculation is completed by converting all utility usage consumed by a building for one year, to British Thermal Units (BTU) and dividing this number by the building square footage. EUI is a good measure of a building's energy use and is utilized regularly for comparison of energy performance for similar building types. The Oak Ridge National Laboratory (ORNL) Buildings Technology Center under a contract with the U.S. Department of Energy maintains a Benchmarking Building Energy Performance Program. The ORNL website determines how a building's energy use compares with similar facilities throughout the U.S. and in a specific region or state.

Source use differs from site usage when comparing a building's energy consumption with the national average. Site energy use is the energy consumed by the building at the building site only. Source energy use includes the site energy use as well as all of the losses to create and distribute the energy to the building. Source energy represents the total amount of raw fuel that is required to operate the building. It incorporates all transmission, delivery, and production losses, which allows for a complete assessment of energy efficiency in a building. The type of utility purchased has a substantial impact on the source energy use of a building. The EPA has determined that source energy is the most comparable unit for evaluation purposes and overall global impact. Both the site and source EUI ratings for the building are provided to understand and compare the differences in energy use.

The site and source EUI for this facility is calculated as follows:

$$\text{Building Site EUI} = \frac{(\text{Electric Usage in kBtu} + \text{Gas Usage in kBtu})}{\text{Building Square Footage}}$$

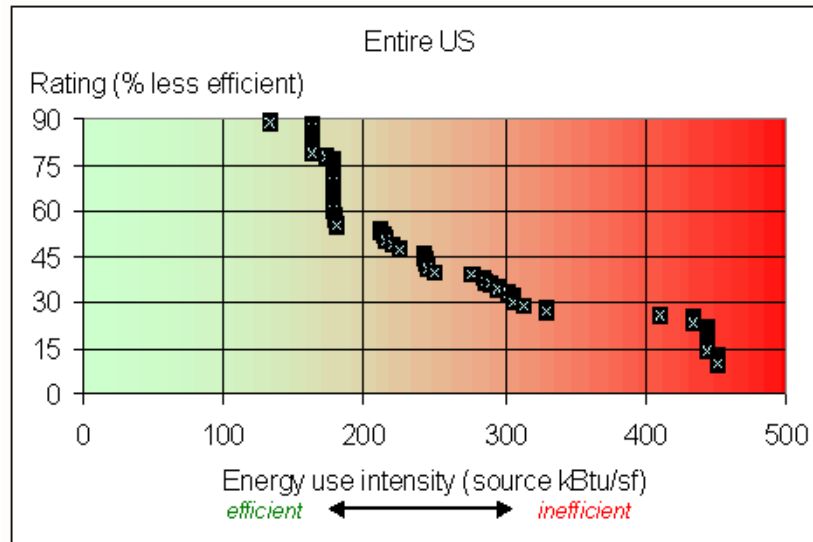
$$\text{Building Source EUI} = \frac{(\text{Electric Usage in kBtu} \times \text{SS Ratio} + \text{Gas Usage in kBtu} \times \text{SS Ratio})}{\text{Building Square Footage}}$$

Table 5
Facility Energy Use Index (EUI) Calculation

ENERGY USE INTENSITY CALCULATION						
ENERGY TYPE	BUILDING USE			SITE ENERGY	SITE-SOURCE RATIO	SOURCE ENERGY
	kWh	Therms	Gallons	kBtu		kBtu
ELECTRIC	1,133,085			3,868,352	3.340	12,920,296
NATURAL GAS				0	1.047	0
FUEL OIL			739.9	102,846	1.010	103,875
PROPANE			0.0	0	1.010	0
TOTAL				3,971,198		13,024,171
*Site - Source Ratio data is provided by the Energy Star Performance Rating Methodology for Incorporating Source Energy Use document issued Dec 2007.						
BUILDING AREA	6,740			SQUARE FEET		
BUILDING SITE EUI	589.20			kBtu/SF/YR		
BUILDING SOURCE EUI	1,932.37			kBtu/SF/YR		

Figure 3 below depicts a national EUI grading for the source use of *Public Order and Safety Buildings*.

Figure 3
Source Energy Use Intensity Distributions: Public Order Buildings



B. EPA Energy Benchmarking System

The United States Environmental Protection Agency (EPA) in an effort to promote energy management has created a system for benchmarking energy use amongst various end users. The benchmarking tool utilized for this analysis is entitled Portfolio Manager. The Portfolio Manager tool allows tracking and assessment of energy consumption via the template forms located on the ENERGY STAR website (www.energystar.gov). The importance of benchmarking for local government municipalities is becoming more important as utility costs continue to increase and emphasis is being placed on carbon reduction, greenhouse gas emissions and other environmental impacts.

Based on information gathered from the ENERGY STAR website, Government agencies spend more than \$10 billion a year on energy to provide public services and meet constituent needs. Furthermore, energy use in commercial buildings and industrial facilities is responsible for more than 50 percent of U.S. carbon dioxide emissions. It is vital that local government municipalities assess facility energy usage, benchmark energy usage utilizing Portfolio Manager, set priorities and goals to lessen energy usage and move forward with priorities and goals.

In accordance with the Local Government Energy Audit Program, CEG has created an ENERGY STAR account for the municipality to access and monitoring the facility's yearly energy usage as it compares to facilities of similar type. The portfolio manager data was set to to be shared with the TRC-LGEA account. The login page for the account can be accessed at the following web address; the username and password are also listed below:

<https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.login>

User Name: Collingswoodcity
Password: lgeaceg09023

Security Question: What city were you born in?
Security Answer: "Collingswood"

The utility bills and other information gathered during the energy audit process are entered into the Portfolio Manager. The following is a summary of the results for the facility:

Table 6
ENERGY STAR Performance Rating

ENERGY STAR PERFORMANCE RATING		
FACILITY DESCRIPTION	ENERGY PERFORMANCE RATING	NATIONAL AVERAGE
Collingswood Water Treatment	N/A	50

Refer to **Statement of Energy Performance Appendix** for the detailed energy summary.

V. FACILITY DESCRIPTION

The facility is a one story 1928 vintage building which houses full water treatment and distribution equipment. An extension was added in 1979. The building floor area totals 6,740 square feet. Construction is masonry with white brick exterior walls. The roof is a combination of A-frame and flat. The facility operates 24 hours per day and does not shut down, however building is occupied by employees 84 hours per week. The windows throughout the facility are older with clear glass and aluminum frames.

Process Equipment

The pumping plant consists of well pumps. The pumps are equipped with VFD's. Efficiencies of these pumps with drives are already maximized, minimizing opportunities for ECM's.

HVAC Systems

The building's primary heating fuel is fuel oil, cooling is electric-fired.

The primary source of heat for the building is a Burnham 252 Mbh Steam boiler located in the basement Boiler room. This oil-fired unit produces low pressure steam which is distributed to unit heaters and cast iron radiators throughout the facility. The boiler was being re-built at the time of our survey due to flood damage.

Cooling is provided by two window AC units located in the two offices. The main area is not mechanically cooled.

Domestic Hot Water

An electric 30 gallon, 9000 watt storage type hot water heater provides the facility with hot water. It is a Bradford White brand, in good condition.

Lighting

The building uses a mixture incandescent fixtures and fluorescent tube fixtures with T-12 lamps and magnetic ballasts. Mercury vapor fixtures are used on the main floor of the building. Tank room has an eighteen foot plus ceiling height with ten porcelain sockets & bare incandescent lamps. Standard switching is utilized and there are no other types of lighting controls present.

The exterior lighting uses primarily high intensity discharge wall & pole mounted fixtures.

The parking lot is lit with high intensity discharge fixtures mounted on light poles.

VI. MAJOR EQUIPMENT LIST

The equipment list is considered major energy consuming equipment and through energy conservation measures could yield substantial energy savings. The list shows the major equipment in the facility and all pertinent information utilized in energy savings calculations. An approximate age was assigned to the equipment in some cases if a manufactures date was not shown on the equipment's nameplate. The ASHRAE service life for the equipment along with the remaining useful life is also shown in the Appendix.

Refer to the **Major Equipment List Appendix** for this facility.

VII. ENERGY CONSERVATION MEASURES

The largest energy user at this facility is the process pumps. CEG notes that these pumps have already been retrofitted with variable frequency drives, with efficient motors to match the drives. As such, opportunities for an ECM regarding pump efficiency are not available. The remaining heating and cooling equipment is unitary in nature and a very small component of this facility's energy use, thus ECM's were not entertained for this equipment.

ECM #1: Lighting Upgrade - General

Description:

CEG recommends replacement of the existing T12 lamps and ballasts with the latest technology T8 lamps and high efficiency electronic ballasts. The new energy efficient T8 lamps will provide adequate lighting and will save electrical costs due to improved performance of the lamps and ballasts. Maintenance savings will be realized by reducing the number of lamps replaced per year. The expected lamp life of a T8 lamp is approximately 30,000 burn-hours, in comparison to the existing T12 lamps which are approximately 20,000 burn-hours. The facility will need approximately 33% fewer lamp replacements per year.

Also, single electronic ballasts can operate up to four lamps, while the existing magnetic ballasts can only operate up to two lamps. The number of ballasts in the facility could be reduced by "tandem wiring" electronic ballasts. Single electronic ballasts may be wired to operate up to four lamps in two or more fixtures.

Existing egress fixture lamp replacement shall be excluded from this ECM so that the current egress light levels are maintained.

Energy Savings Calculations:

The Investment Grade Lighting Audit appendix outlines the proposed retrofits, costs, savings, and payback periods.

NJ Smart Start[®] Program Incentives are calculated as follows:

From the Smart Start Incentive appendix, the replacement of a T-12 fixture to a T-5 or T-8 fixture warrants the following incentive: (1-2 lamp) = \$10 per fixture; (3-4 lamp) = \$20 per fixture.

$$\text{Smart Start Incentive} = (\# \text{ of } 1\text{-}2 \text{ lamp fixtures} \times \$10) + (\# \text{ of } 3\text{-}4 \text{ lamp fixtures} \times \$20)$$

$$\begin{aligned} \text{Smart Start Incentive} &= ((10)\text{-}1\&2 \text{ lamp fixtures} \times \$10) = \$100 \\ &= ((2)\text{-}3\&4 \text{ lamp fixtures} \times \$20) = \underline{\$20} \\ &= \underline{\$120} \end{aligned}$$

Maintenance Savings are calculated as follows:

Maintenance Savings = *(reduction in lamps replaced per year) x (replacement \$ per lamp + labor \$ per lamp)*

Maintenance Savings = *(10 lamps per year) x (\$2.00 + \$5.00) = \$70*

Energy Savings Summary:

ECM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$1,590
NJ Smart Start Equipment Incentive (\$):	\$140
Net Installation Cost (\$):	\$1,450
Maintenance Savings (\$/Yr):	\$70
Energy Savings (\$/Yr):	\$644
Total Yearly Savings (\$/Yr):	\$714
Estimated ECM Lifetime (Yr):	15
Simple Payback	2.0
Simple Lifetime ROI	638.6%
Simple Lifetime Maintenance Savings	\$1,050
Simple Lifetime Savings	\$9,660
Internal Rate of Return (IRR)	49%
Net Present Value (NPV)	\$6,615.40

VIII. RENEWABLE/DISTRIBUTED ENERGY MEASURES

Globally, renewable energy has become a priority affecting international and domestic energy policy. The State of New Jersey has taken a proactive approach, and has recently adopted in its Energy Master Plan a goal of 30% renewable energy by 2020. To help reach this goal New Jersey created the Office of Clean Energy under the direction of the Board of Public Utilities and instituted a Renewable Energy Incentive Program to provide additional funding to private and public entities for installing qualified renewable technologies. A renewable energy source can greatly reduce a building's operating expenses while producing clean environmentally friendly energy. CEG has assessed the feasibility of installing renewable energy measures (REM) for the municipality utilizing renewable technologies and concluded that there is potential for solar energy generation. The solar photovoltaic system calculation summary will be concluded as **REM#1** within this report.

Solar energy produces clean energy and reduces a building's carbon footprint. This is accomplished via photovoltaic panels which will be mounted on all south and southwestern facades of the building. Flat roof, as well as sloped areas can be utilized; flat areas will have the panels turned to an optimum solar absorbing angle. (A structural survey of the roof would be necessary before the installation of PV panels is considered). The state of NJ has instituted a program in which one Solar Renewable Energy Certificate (SREC) is given to the Owner for every 1000 kWh of generation. SREC's can be sold anytime on the market at their current market value. The value of the credit varies upon the current need of the power companies. The average value per credit is around \$350, this value was used in our financial calculations. This equates to \$0.35 per kWh generated.

CEG has reviewed the existing roof area of the building being audited for the purposes of determining a potential for a roof mounted photovoltaic system. A roof area of 3600 S.F. can be utilized for a PV system. A depiction of the area utilized is shown in **Renewable / Distributed Energy Measures Calculation Appendix**. Using this square footage it was determined that a system size of 50.8 kilowatts could be installed. A system of this size has an estimated kilowatt hour production of 79,323 KWh annually, reducing the overall utility bill by approximately 3.5% percent. A detailed financial analysis can be found in the **Renewable / Distributed Energy Measures Calculation Appendix**. This analysis illustrates the payback of the system over a 25 year period. The eventual degradation of the solar panels and the price of accumulated SREC's are factored into the payback.

The proposed photovoltaic array layout is designed based on the specifications for the Sun Power SPR-230 panel. This panel has a "DC" rated full load output of 230 watts, and has a total panel conversion efficiency of 18%. Although panels rated at higher wattages are available through Sun Power and other various manufacturers, in general most manufacturers who produce commercially available solar panels produce a similar panel in the 200 to 250 watt range. This provides more manufacturer options to the public entity if they wish to pursue the proposed solar recommendation without losing significant system capacity.

The array system capacity was sized on available roof space on the existing facility. Estimated solar array generation was then calculated based on the National Renewable Energy Laboratory

PVWatts Version 1.0 Calculator. In order to calculate the array generation an appropriate location with solar data on file must be selected. In addition the system DC rated kilowatt (kW) capacity must be inputted, a DC to AC de-rate factor, panel tilt angle, and array azimuth angle. The DC to AC de-rate factor is based on the panel nameplate DC rating, inverter and transformer efficiencies (95%), mismatch factor (98%), diodes and connections (100%), dc and ac wiring (98%, 99%), soiling, (95%), system availability (95%), shading (if applicable), and age (new/100%). The overall DC to AC de-rate factor has been calculated at an overall rating of 81%. The PVWatts Calculator program then calculates estimated system generation based on average monthly solar irradiance and user provided inputs. The monthly energy generation and offset electric costs from the PVWatts calculator is shown in the **Renewable/Distributed Energy Measures Calculation Appendix**.

The proposed solar array is qualified by the New Jersey Board of Public Utilities Net Metering Guidelines as a Class I Renewable Energy Source. These guidelines allow onsite customer generation using renewable energy sources such as solar and wind with a capacity of 2 megawatts (MW) or less. This limits a customer system design capacity to being a net user and not a net generator of electricity on an annual basis. Although these guidelines state that if a customer does not generate (produce more electricity than they use), the customer will be credited those kilowatt-hours generated to be carried over for future usage on a month to month basis. Then, on an annual basis if the customer is a net generator the customer will then be compensated by the utility the average annual PJM Grid LMP price per kilowatt-hour for the over generation. Due to the aforementioned legislation, the customer is at limited risk if they generate more than they use at times throughout the year. With the inefficiency of today's energy storage systems, such as batteries, the added cost of storage systems is not warranted and was not considered in the proposed design.

CEG has reviewed financing options for the owner. Two options were studied and they are as follows: Self-financed and direct purchase without finance. Self-finance was calculated with 95% of the total project cost financed at a 7% interest rate over 25 years. Direct purchase involves the local government paying for 100% of the total project cost upfront via one of the methods noted in the Installation Funding Options section below. Both of these calculations include a utility inflation rate as well as the degradation of the solar panels over time. Based on our calculations the following are the payback periods for the respective method of payment:

Table 7
Financial Summary – Photovoltaic System

FINANCIAL SUMMARY - PHOTOVOLTAIC SYSTEM			
PAYMENT TYPE	SIMPLE PAYBACK	LIFETIME ROI	INTERNAL RATE OF RETURN
Self-Finance	11.33 Years	120.6%	20.8%
Direct Purchase	11.33 Years	120.6%	7.9%

*The solar energy measure is shown for reference in the executive summary Renewable Energy Measure (REM) table

The resultant Internal Rate of Return indicates that if the Owner was able to “self-finance” the solar project, the project would be slightly more beneficial to the Owner. However, if the Owner was able to work out a Power Purchase Agreement with a third-party and agree upon a decent base energy rate for kilowatt hour production, the “direct purchase” option could also, prove to be a beneficial route.

Energy Savings Summary:

REM #1 - ENERGY SAVINGS SUMMARY	
Installation Cost (\$):	\$457,470
NJ Smart Start Equipment Incentive (\$):	\$0
Net Installation Cost (\$):	\$457,470
Maintenance Savings (\$/Yr):	\$27,763
Energy Savings (\$/Yr):	\$12,612
Total Yearly Savings (\$/Yr):	\$40,375
Estimated ECM Lifetime (Yr):	25
Simple Payback	11.3
Simple Lifetime ROI	120.6%
Simple Lifetime Maintenance Savings	\$694,072
Simple Lifetime Savings	\$315,307
Internal Rate of Return (IRR)	7%
Net Present Value (NPV)	\$245,588.96

In addition to the Solar Analysis, CEG also conducted a review of the applicability of wind energy for the facility. Wind energy production is another option available through the Renewable Energy Incentive Program. Wind turbines of various types can be utilized to produce clean energy on a per building basis. Cash incentives are available per kWh of electric usage. Based on CEG’s review of the applicability of wind energy for the facility, it was determined that the average wind speed is not adequate. Therefore, wind energy is not a viable option to implement.

IX. ENERGY PURCHASING AND PROCUREMENT STRATEGY

Load Profile:

Load Profile analysis was performed to determine the seasonal energy usage of the facility. Irregularities in the load profile will indicate potential problems within the facility. Consequently based on the profile a recommendation will be made to remedy the irregularity in energy usage. For this report, the facility's energy consumption data was gathered in table format and plotted in graph form to create the load profile. The Electric and Natural Gas Usage Profiles included within this report to reference the respective electricity and natural gas usage load profile.

Electricity:

The Electric Usage Profile demonstrates a fairly typical cooling load profile. And the balance of the year has a very flat and elevated load profile. The load profile is said to be typical for cooling because the load creeps up in consumption beginning in May with a nice bell shaped curve the entire summer (May-October). The load erodes from there following the summer and the cooling season. Cooling in this facility is provided by (2) two window units in the offices. Domestic hot water is provided by a Bradford White, 30 gallon electric water heater. This facility utilizes the Delivery service (LPLP), from Public Service Electric and Gas Company (PSE&G) and its Commodity service from PEPCO Energy Services. A base-load shaping is important because a flat consumption profile will yield more competitive pricing when shopping for a Third Party Supplier.

Natural Gas:

There is no natural gas service at this facility.

Heating Oil / # 2 Fuel Oil:

The primary source for heat is a steam boiler. This oil sourced boiler produces steam at a low pressure that is distributed to unit heaters and cast iron radiators throughout the facility.

Tariff Analysis:

Electricity:

This facility receives electrical service through Public Service Electric and Gas Company (PSE&G) on a LPLS (Large Power Lighting Service) rate schedule. This facility utilizes PEPCO Energy Services for its Commodity service.

The LPLS utility tariff is for delivery service for general purposes at secondary distribution voltages where the customers measured peak demand exceeds 150 kW in any given month and also at primary distribution voltages. Customers may either purchase electric supply from a Third Party Supplier (TPS) or from PSE&G's Basic Generation Service default service as detailed in the rate schedule. The rate schedule has a Delivery Charge; Distribution kW and kWh

Charge, Societal Benefits Charge, Non-utility Generation Charge, Securitization Charge, System Control Charge, Customer Account Services Charge, Standby Fee, Base Rate Distribution Adjustment Charge, Solar Pilot Recovery Charge and RGGI Charge. The customer can elect to have the Commodity Charge serviced through the utility or by a Third Party Supplier (TPS).

This facility has chosen a Third Party Supplier (PEPCO Energy Services) for its Commodity requirements.

A flat load profile will allow for a more competitive energy price when shopping for an “alternate energy source”.

Natural Gas:

There is no natural gas service at this location.

Heating Oil/Fuel Oil:

The fuel oil is provided by a local supplier (jobber) Majestic Oil Company. Majestic provides, Heating, Cooling and Fuel Oil services. Typically company's of this type concentrate more on Maintenance than on pricing options. However, other than budget plans, Collingswood should contact this supplier or other suppliers to see if they can hedge the oil, offer fixed price contracts or other options. Collingswood should compare these options among other suppliers. An energy advisor could help with this service.

Recommendations:

CEG recommends a global approach that will be consistent with all facilities. CEG's has observed potential savings in the electricity and natural gas costs. The Boroughs' "weighted average price-to-compare" per kWh (kilowatt hour) for all buildings is \$.1053/kWh (kWh is the common unit of electric measure). Primary electricity is consumed by the Water Treatment Facility.

The "price to compare" (electricity) is defined as the price that would be compared to the equivalent utility price extracting the utility transmission and distribution costs (wires charges). This would be a market based price that would be supplied by a Third Party Supplier (TPS) or an alternative supplier.

Energy commodities are among the most volatile of all commodities, however at this point and time, energy is extremely competitive. The Borough could see significant savings if it were to take advantage of these current market prices quickly, before energy increases. Based on last year's historical consumption and current electric rates, The Borough would see an improvement of over \$80,000 or over 20% annually. Note: Savings were calculated using The Boroughs Average Annual Consumption of 3,286,856 kWh's and a variance of approximately \$.0253/kWh and utilizing a fixed one-year commodity contract). Collingswood should aggregate its entire electric load to gain the most optimal energy costs and to base-load its usage. CEG recommends advisement for alternative sourcing and supply of energy on a "managed approach".

CEG recommends the use of an “energy advisor” for review and implementation of a formal energy procurement program. The current program (fixed price contracts) may not meet the needs of the Borough. The Borough needs to build a program that is budget driven. This can be accomplished with the use of an “energy advisor”.

CEG recommends scheduling a meeting with their current utility providers to review their utility charges and current tariff structures for electricity and oil. This meeting would provide insight regarding alternative procurement options that might be available. Through its meeting with the Local Distribution Company (LDC), The Borough will learn more about the competitive supply process. The Borough can acquire a list of approved Third Party Suppliers from the New Jersey Board of Public Utilities website at www.nj.gov/bpu. The Borough should also consider using a billing-auditing service to further analyze the utility invoices, manage the data and use the data to manage ongoing demand-side management projects. Furthermore, CEG recommends South Brunswick pay attention to credit mechanisms, imbalances, balancing charges and commodity charges when meeting with their utility representative. In addition, they should also ask the utility representative about alternative billing options. Some utilities allow for consolidated billing options when utilizing the service of a Third Party Supplier.

Finally, if Collingswood frequently changes its supplier for energy, it needs to closely monitor balancing, particularly when the contract is close to termination.

X. INSTALLATION FUNDING OPTIONS

CEG has reviewed various funding options for the facility owner to utilize in subsidizing the costs for installing the energy conservation measures noted within this report. Below are a few alternative funding methods:

- i. *Energy Savings Improvement Program (ESIP)* – Public Law 2009, Chapter 4 authorizes government entities to make energy related improvements to their facilities and pay for the costs using the value of energy savings that result from the improvements. The “Energy Savings Improvement Program (ESIP)” law provides a flexible approach that can allow all government agencies in New Jersey to improve and reduce energy usage with minimal expenditure of new financial resources.
- ii. *Municipal Bonds* – Municipal bonds are a bond issued by a city or other local government, or their agencies. Potential issuers of municipal bonds include cities, counties, redevelopment agencies, school districts, publicly owned airports and seaports, and any other governmental entity (or group of governments) below the state level. Municipal bonds may be general obligations of the issuer or secured by specified revenues. Interest income received by holders of municipal bonds is often exempt from the federal income tax and from the income tax of the state in which they are issued, although municipal bonds issued for certain purposes may not be tax exempt.
- iii. *Power Purchase Agreement* – Public Law 2008, Chapter 3 authorizes contractor of up to fifteen (15) years for contracts commonly known as “power purchase agreements.” These are programs where the contracting unit (Owner) procures a contract for, in most cases, a third party to install, maintain, and own a renewable energy system. These renewable energy systems are typically solar panels, windmills or other systems that create renewable energy. In exchange for the third party’s work of installing, maintaining and owning the renewable energy system, the contracting unit (Owner) agrees to purchase the power generated by the renewable energy system from the third party at agreed upon energy rates.

XI. ADDITIONAL RECOMMENDATIONS

The following recommendations include no cost/low cost measures, Operation & Maintenance (O&M) items, and water conservation measures with attractive paybacks. These measures are not eligible for the Smart Start Buildings incentives from the office of Clean Energy but save energy none the less.

- A. Chemically clean the condenser and evaporator coils periodically to optimize efficiency. Poorly maintained heat transfer surfaces can reduce efficiency 5-10%.
- B. Maintain all weather stripping on windows and doors.
- C. Clean all light fixtures to maximize light output.
- D. Provide more frequent air filter changes to decrease overall system power usage and maintain better IAQ.

ECM COST & SAVINGS BREAKDOWN

CONCORD ENGINEERING GROUP

Collingswood - Water Treatment Building

ECM ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
ECM NO.	DESCRIPTION	INSTALLATION COST				YEARLY SAVINGS			ECM LIFETIME	LIFETIME ENERGY SAVINGS	LIFETIME MAINTENANCE SAVINGS	LIFETIME ROI	SIMPLE PAYBACK	INTERNAL RATE OF RETURN	NET PRESENT VALUE (NPV)
		MATERIAL	LABOR	REBATES, INCENTIVES	NET INSTALLATION COST	ENERGY	MAINT. / SREC	TOTAL		(Yearly Saving * ECM Lifetime)	(Yearly Maint Svaing * ECM Lifetime)	(Lifetime Savings - Net Cost) / (Net Cost)	(Net cost / Yearly Savings)	$\sum_{n=0}^N \frac{C_n}{(1+IRR)^n}$	$\sum_{n=0}^N \frac{C_n}{(1+DR)^n}$
		(\$)	(\$)	(\$)	(\$)	(\$/Yr)	(\$/Yr)	(\$/Yr)		(\$)	(\$)	(%)	(Yr)	(\$)	(\$)
ECM #1	Lighting Upgrade - General	\$0	\$1,590	\$140	\$1,450	\$644	\$70	\$714	15	\$9,660	\$1,050	638.6%	2.0	49.06%	\$6,615.40
REM RENEWABLE ENERGY AND FINANCIAL COSTS AND SAVINGS SUMMARY															
REM #1	Photovoltaic System	\$457,470	\$0	\$0	\$457,470	\$12,612	\$27,763	\$40,375	25	\$315,307	\$694,072	120.6%	11.3	7.31%	\$245,588.96

- Notes:
- 1) The variable Cn in the formulas for Internal Rate of Return and Net Present Value stands for the cash flow during each period.
 - 2) The variable DR in the NPV equation stands for Discount Rate
 - 3) For NPV and IRR calculations: From n=0 to N periods where N is the *lifetime of ECM* and Cn is the *cash flow during each period* .

Concord Engineering Group, Inc.

520 BURNT MILL ROAD
VOORHEES, NEW JERSEY 08043
PHONE: (856) 427-0200
FAX: (856) 427-6508



SmartStart Building Incentives

The NJ SmartStart Buildings Program offers financial incentives on a wide variety of building system equipment. The incentives were developed to help offset the initial cost of energy-efficient equipment. The following tables show the current available incentives as of January, 2009:

Electric Chillers

Water-Cooled Chillers	\$12 - \$170 per ton
Air-Cooled Chillers	\$8 - \$52 per ton

Gas Cooling

Gas Absorption Chillers	\$185 - \$400 per ton
Gas Engine-Driven Chillers	Calculated through custom measure path)

Desiccant Systems

	\$1.00 per cfm – gas or electric
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Electric Unitary HVAC

Unitary AC and Split Systems	\$73 - \$93 per ton
Air-to-Air Heat Pumps	\$73 - \$92 per ton
Water-Source Heat Pumps	\$81 per ton
Packaged Terminal AC & HP	\$65 per ton
Central DX AC Systems	\$40- \$72 per ton
Dual Enthalpy Economizer Controls	\$250

Ground Source Heat Pumps

Closed Loop & Open Loop	\$370 per ton
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Gas Heating

Gas Fired Boilers < 300 MBH	\$300 per unit
Gas Fired Boilers ≥ 300 - 1500 MBH	\$1.75 per MBH
Gas Fired Boilers ≥ 1500 - ≤ 4000 MBH	\$1.00 per MBH
Gas Fired Boilers > 4000 MBH	(Calculated through Custom Measure Path)
Gas Furnaces	\$300 - \$400 per unit

Variable Frequency Drives

Variable Air Volume	\$65 - \$155 per hp
Chilled-Water Pumps	\$60 per hp
Compressors	\$5,250 to \$12,500 per drive

Natural Gas Water Heating

Gas Water Heaters ≤ 50 gallons	\$50 per unit
Gas-Fired Water Heaters >50 gallons	\$1.00 - \$2.00 per MBH
Gas-Fired Booster Water Heaters	\$17 - \$35 per MBH

Premium Motors

Three-Phase Motors	\$45 - \$700 per motor
--------------------	------------------------

Prescriptive Lighting

T-5 and T-8 Lamps w/Electronic Ballast in Existing Facilities	\$10 - \$30 per fixture, (depending on quantity)
Hard-Wired Compact Fluorescent	\$25 - \$30 per fixture
Metal Halide w/Pulse Start	\$25 per fixture
LED Exit Signs	\$10 - \$20 per fixture
T-5 and T-8 High Bay Fixtures	\$16 - \$284 per fixture

Lighting Controls – Occupancy Sensors

Wall Mounted	\$20 per control
Remote Mounted	\$35 per control
Daylight Dimmers	\$25 per fixture
Occupancy Controlled hi- low Fluorescent Controls	\$25 per fixture controlled

Lighting Controls – HID or Fluorescent Hi-Bay Controls

Occupancy hi-low	\$75 per fixture controlled
Daylight Dimming	\$75 per fixture controlled

Other Equipment Incentives

Performance Lighting	\$1.00 per watt per SF below program incentive threshold, currently 5% more energy efficient than ASHRAE 90.1-2004 for New Construction and Complete Renovation
Custom Electric and Gas Equipment Incentives	not prescriptive

STATEMENT OF ENERGY PERFORMANCE

Collingswood Water Plant

Building ID: 1946460

For 12-month Period Ending: September 30, 2009¹

Date SEP becomes ineligible: N/A

Date SEP Generated: December 03, 2009

Facility
Collingswood Water Plant
215 Hillcrest Ave
Collingswood, NJ 08108

Facility Owner
N/A

Primary Contact for this Facility
N/A

Year Built: 1928

Gross Floor Area (ft²): 6,740Energy Performance Rating² (1-100) N/A**Site Energy Use Summary³**

Electricity - Grid Purchase(kBtu) 7,696,554

Natural Gas - (kBtu)⁴ 0

Total Energy (kBtu) 7,696,554

Energy Intensity⁵Site (kBtu/ft²/yr) 1142Source (kBtu/ft²/yr) 3814**Emissions (based on site energy use)**Greenhouse Gas Emissions (MtCO₂e/year) 1,172**Electric Distribution Utility**

PSE&G - Public Service Elec & Gas Co

National Average Comparison

National Average Site EUI 104

National Average Source EUI 213

% Difference from National Average Source EUI 1691%

Building Type Other

Stamp of Certifying Professional

Based on the conditions observed at the time of my visit to this building, I certify that the information contained within this statement is accurate.

Meets Industry Standards⁶ for Indoor Environmental Conditions:

Ventilation for Acceptable Indoor Air Quality N/A

Acceptable Thermal Environmental Conditions N/A

Adequate Illumination N/A

Certifying Professional

N/A

Notes:

1. Application for the ENERGY STAR must be submitted to EPA within 4 months of the Period Ending date. Award of the ENERGY STAR is not final until approval is received from EPA.
2. The EPA Energy Performance Rating is based on total source energy. A rating of 75 is the minimum to be eligible for the ENERGY STAR.
3. Values represent energy consumption, annualized to a 12-month period.
4. Natural Gas values in units of volume (e.g. cubic feet) are converted to kBtu with adjustments made for elevation based on Facility zip code.
5. Values represent energy intensity, annualized to a 12-month period.
6. Based on Meeting ASHRAE Standard 62 for ventilation for acceptable indoor air quality, ASHRAE Standard 55 for thermal comfort, and IESNA Lighting Handbook for lighting quality.

ENERGY STAR® Data Checklist for Commercial Buildings

In order for a building to qualify for the ENERGY STAR, a Professional Engineer (PE) must validate the accuracy of the data underlying the building's energy performance rating. This checklist is designed to provide an at-a-glance summary of a property's physical and operating characteristics, as well as its total energy consumption, to assist the PE in double-checking the information that the building owner or operator has entered into Portfolio Manager.

Please complete and sign this checklist and include it with the stamped, signed Statement of Energy Performance.

NOTE: You must check each box to indicate that each value is correct, OR include a note.

CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Building Name	Collingswood Water Plant	Is this the official building name to be displayed in the ENERGY STAR Registry of Labeled Buildings?		<input type="checkbox"/>
Type	Other	Is this an accurate description of the space in question?		<input type="checkbox"/>
Location	215 Hillcrest Ave, Collingswood, NJ 08108	Is this address accurate and complete? Correct weather normalization requires an accurate zip code.		<input type="checkbox"/>
Single Structure	Single Facility	Does this SEP represent a single structure? SEPs cannot be submitted for multiple-building campuses (with the exception of acute care or children's hospitals) nor can they be submitted as representing only a portion of a building		<input type="checkbox"/>
Collingswood Water Treatment (Other)				
CRITERION	VALUE AS ENTERED IN PORTFOLIO MANAGER	VERIFICATION QUESTIONS	NOTES	
Gross Floor Area	6,740 Sq. Ft.	Does this square footage include all supporting functions such as kitchens and break rooms used by staff, storage areas, administrative areas, elevators, stairwells, atria, vent shafts, etc. Also note that existing atriums should only include the base floor area that it occupies. Interstitial (plenum) space between floors should not be included in the total. Finally gross floor area is not the same as leasable space. Leasable space is a subset of gross floor area.		<input type="checkbox"/>
Number of PCs	1 (Optional)	Is this the number of personal computers in the space?		<input type="checkbox"/>
Weekly operating hours	84 Hours(Optional)	Is this the total number of hours per week that the space is 75% occupied? This number should exclude hours when the facility is occupied only by maintenance, security, or other support personnel. For facilities with a schedule that varies during the year, "operating hours/week" refers to the total weekly hours for the schedule most often followed.		<input type="checkbox"/>
Workers on Main Shift	5 (Optional)	Is this the number of employees present during the main shift? Note this is not the total number of employees or visitors who are in a building during an entire 24 hour period. For example, if there are two daily 8 hour shifts of 100 workers each, the Workers on Main Shift value is 100.		<input type="checkbox"/>

ENERGY STAR® Data Checklist for Commercial Buildings

Energy Consumption

Power Generation Plant or Distribution Utility: PSE&G - Public Service Elec & Gas Co

Fuel Type: Electricity		
Meter: Electric (kWh (thousand Watt-hours)) Space(s): Entire Facility Generation Method: Grid Purchase		
Start Date	End Date	Energy Use (kWh (thousand Watt-hours))
08/15/2009	09/14/2009	245,972.00
07/15/2009	08/14/2009	251,694.00
06/15/2009	07/14/2009	227,934.00
05/15/2009	06/14/2009	169,100.00
04/15/2009	05/14/2009	162,392.00
03/15/2009	04/14/2009	160,100.00
02/15/2009	03/14/2009	183,172.00
01/15/2009	02/14/2009	174,440.00
12/15/2008	01/14/2009	148,230.00
11/15/2008	12/14/2008	185,548.00
10/15/2008	11/14/2008	149,816.00
Electric Consumption (kWh (thousand Watt-hours))		2,058,398.00
Electric Consumption (kBtu (thousand Btu))		7,023,253.98
Total Electricity (Grid Purchase) Consumption (kBtu (thousand Btu))		7,023,253.98
Is this the total Electricity (Grid Purchase) consumption at this building including all Electricity meters?		<input type="checkbox"/>

Additional Fuels	
Do the fuel consumption totals shown above represent the total energy use of this building? Please confirm there are no additional fuels (district energy, generator fuel oil) used in this facility.	<input type="checkbox"/>

On-Site Solar and Wind Energy	
Do the fuel consumption totals shown above include all on-site solar and/or wind power located at your facility? Please confirm that no on-site solar or wind installations have been omitted from this list. All on-site systems must be reported.	<input type="checkbox"/>

Certifying Professional

(When applying for the ENERGY STAR, the Certifying Professional must be the same as the PE that signed and stamped the SEP.)

Name: _____ Date: _____

Signature: _____

Signature is required when applying for the ENERGY STAR.

FOR YOUR RECORDS ONLY. DO NOT SUBMIT TO EPA.

Please keep this Facility Summary for your own records; do not submit it to EPA. Only the Statement of Energy Performance (SEP), Data Checklist and Letter of Agreement need to be submitted to EPA when applying for the ENERGY STAR.

Facility
Collingswood Water Plant
215 Hillcrest Ave
Collingswood, NJ 08108

Facility Owner
N/A

Primary Contact for this Facility
N/A

General Information

Collingswood Water Plant	
Gross Floor Area Excluding Parking: (ft ²)	6,740
Year Built	1928
For 12-month Evaluation Period Ending Date:	September 30, 2009

Facility Space Use Summary

Collingswood Water Treatment	
Space Type	Other - Other
Gross Floor Area(ft ²)	6,740
Number of PCs ^o	1
Weekly operating hours ^o	84
Workers on Main Shift ^o	5

Energy Performance Comparison

Performance Metrics	Evaluation Periods		Comparisons		
	Current (Ending Date 09/30/2009)	Baseline (Ending Date 09/30/2009)	Rating of 75	Target	National Average
Energy Performance Rating	N/A	N/A	75	N/A	N/A
Energy Intensity					
Site (kBtu/ft ²)	1142	1142	0	N/A	104
Source (kBtu/ft ²)	3814	3814	0	N/A	213
Energy Cost					
\$/year	\$ 148,052.13	\$ 148,052.13	N/A	N/A	\$ 13,483.80
\$/ft ² /year	\$ 21.97	\$ 21.97	N/A	N/A	\$ 2.00
Greenhouse Gas Emissions					
MtCO ₂ e/year	1,172	1,172	0	N/A	107
kgCO ₂ e/ft ² /year	174	174	0	N/A	16

More than 50% of your building is defined as Other. This building is currently ineligible for a rating. Please note the National Average column represents the CBECS national average data for Other. This building uses X% less energy per square foot than the CBECS national average for Other.

Notes:

o - This attribute is optional.

d - A default value has been supplied by Portfolio Manager.

Borough of Collingswood - Water Treatment

EQUIPMENT LIST									
TAG	MAKE	MODEL	TYPE	CAPACITY	EFFICIENCY	SERVES	LOCATION	REMAINING USEFUL LIFE	NOTES
B-1	BURNHAM	PV87SC-HBUN	OIL-FIRED CAST IRON SECTIONAL STEAM BOILER	252 MBH	80%	ENTIRE BUILDING	BASEMENT BOILER ROOM	N/A	CONDITION - POOR, BOILER IS BEING RE-BUILT / REPLACED DUE TO RECENT FLOODING. YEAR 2000 VINTAGE
HWH	BRADFORD WHITE	MI30R6D513	ELECTRIC DOMESTIC HOT WATER HEATER	30 GALLON, 9000 WATTS	100%	ENTIRE BUILDING	BASEMENT BOILER ROOM		CONDITION- GOOD
AC-1	GE	ASP05LDS1		5200 BTUH	-	OFFICE #1	OFFICE #1	-	CONDITION- GOOD
AC-2	SHARP	-	WINDOW AC UNIT	-	-	OFFICE #2	OFFICE #2	-	CONDITION- GOOD
RADIATORS (4)	-	-	CAST IRON RADIATORS	-	-	THROUGHOUT	THROUGHOUT	-	QUANTITY - 4
UNIT HEATERS (2)	WESTINGHOUSE	-	HORIZONTAL HW UNIT HEATER	-	-	MAIN AREA	MAIN AREA	-	QUANTITY - 2

ECM #1: Lighting Upgrade

Water Treatment Building

Appendix E

CEG Project #: 9C09083
Project Name : Borough of Collingswood Energy Audit
Address: 215 Hillcrest Ave.
City, State: Collingswood, NJ 08108

Page 1 of 2
Date 12/02/09
kWh Cost \$0.135

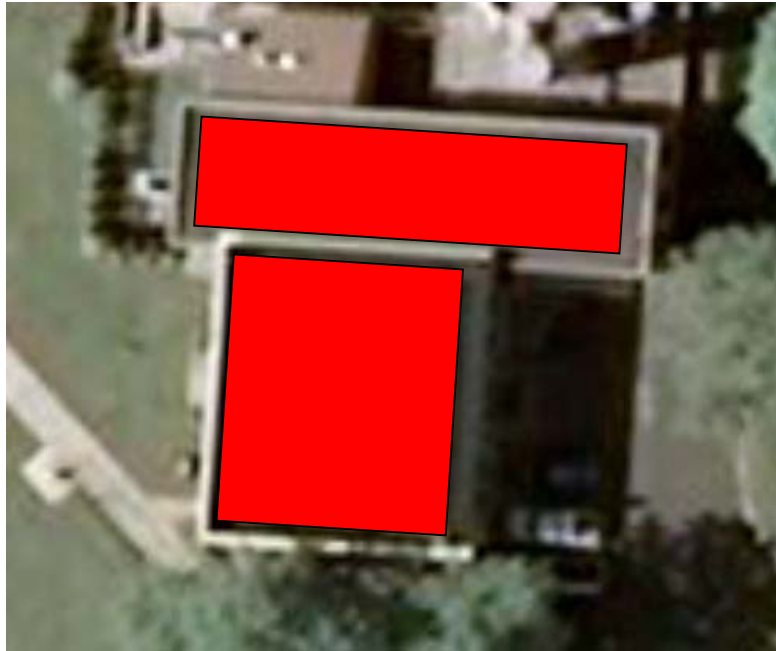
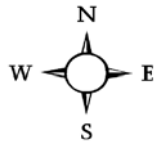
Fixture Location	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
	Usage, Hrs/Yr	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Annual Energy Cost	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Energy Savings, Watts	Energy Savings, kWh/Yr	Savings/Yr, \$	Simple Payback, Yrs	Unit Cost, Installed	Total Cost, Installed	Rebate Estimate
First Floor															
Main Floor	1300	6	(1)400w Mer. Vpr. Lamp. Stem Mounted Fixture w/Mag. Ballast - 400w	2400	\$421.20	6	Existing to Remain	0	2400	3,120	\$421.20	0.0	\$0.00	\$0.00	\$0.00
Main Floor gauges	2600	2	(1)60w Incand. Lamp. Angle Reflector Fixture - 60w	120	\$42.12	2	(1)19w CFL Sylvania Lamp CF19EL/MINI/830 19w	36	84	218	\$29.48	1.1	\$15.60	\$31.20	\$0.00
Front Office	1566	4	(2)40w T-12 Lamps. 1' x 4' Ceiling Mounted Fixture w/ Magnetic Ballast - 77w	308	\$65.11	4	(2)32w T8 Sylvania Lamps #FO32 Sylvania Ballast #QHE 48w	192	116	182	\$24.52	12.9	\$89.05	\$356.20	\$40.00
Office Toilet	260	1	(1)100w Incand. Lamp. Wall Mounted Fixture - 100w	100	\$3.51	1	32w Edison-base CFL	32	68	18	\$2.39	7.5	\$17.80	\$17.80	\$0.00
Office File Room	260	1	(1)100w Incand. Lamp. Wall Mounted Fixture - 100w	100	\$3.51	1	32w Edison-base CFL	32	68	18	\$2.39	7.5	\$17.80	\$17.80	\$0.00
Second Office	780	4	(2)40w T-12 Lamps. 1' x 4' Ceiling Mounted Fixture w/ Magnetic Ballast - 77w	308	\$32.43	4	(2)32w T8 Sylvania Lamps #FO32 Sylvania Ballast #QHE 48w	192	116	90	\$12.21	25.9	\$89.05	\$356.20	\$40.00
Basement	520	2	(1)100w Incand. Lamp. Ceiling Mounted Fixture - 100w	200	\$14.04	2	32w Edison-base CFL	64	136	71	\$9.55	3.7	\$17.80	\$35.60	\$0.00
Exterior Entances	260	4	(1)25w Incand. Lamp. Weather-proof Wall Lantern Fixture - 25w	100	\$3.51	4	10w Edison-base CFL	40	60	16	\$2.11	28.3	\$14.90	\$59.60	\$0.00
Pump Room	2340	2	(2)40w T-12 Lamps. Wall Mounted Fixture - 77w	154	\$48.65	2	(2)32w T8 Sylvania Lamps #FO32 Sylvania Ballast #QHE 48w	96	58	136	\$18.32	8.6	\$89.05	\$178.10	\$20.00
Around Building Exterior	2340	8	(1)100w HPS Lamp. Wall Pack Fixture - 100w	800	\$252.72	8	Existing to Remain	800	0	0	\$0.00		\$0.00	\$0.00	\$0.00


	Existing Lt Fixtures					Proposed Lt Fixtures			Proposed Ltg Savings				Proposed Ltg Installation Cost		
Fixture Location	Usage, Hrs/Yr	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Annual Energy Cost	Fixt Qty	Lighting Fixture Description	Total Watts - Location	Energy Savings, Watts	Energy Savings, kWh/Yr	Savings/Yr, \$	Simple Payback, Yrs	Unit Cost, Installed	Total Cost, Installed	Rebate Estimate
Detention Pump room	520	2	(4)40w T-12 Lamp. Weather- proof Ceiling Fixture - 154w	308	\$21.62	2	(4)32w T8 Sylvania Lamps #FO32 Sylvania Ballast #QHE 95w	190	118	61	\$8.28	18.2	\$95.55	\$191.10	\$40.00
Tank room	780	10	(1)150w Incand. Lamp. Ceiling Mounted Fixture - 150w	1500	\$157.95	10	42w Edison-base CFL	420	1080	842	\$113.72	3.0	\$34.65	\$346.50	\$0.00
First Floor Summary		46		6398	\$1,066.38	46		2094	4304	4771.7	\$644.18	2.3		\$1,590.10	\$140.00
COMMENTS:															

Project Name: LGEA Solar PV Project - Collingswood Water Treatment Plant									
Location: Collingswood, NJ									
Description: Photovoltaic System 95% Financing - 20 year									
Simple Payback Analysis									
		Photovoltaic System 95% Financing - 20 year							
Total Construction Cost		\$457,470							
Annual kWh Production		79,323							
Annual Energy Cost Reduction		\$12,612							
Annual SREC Revenue		\$27,763							
First Cost Premium		\$457,470							
Simple Payback:		11.33						Years	
Life Cycle Cost Analysis									
Analysis Period (years):		25				Financing %:		95%	
Financing Term (mths):		300				Maintenance Escalation Rate:		3.0%	
Average Energy Cost (\$/kWh)		\$0.159				Energy Cost Escalation Rate:		3.0%	
Financing Rate:		7.00%				SREC Value (\$/kWh)		\$0.350	
Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Interest Expense	Loan Principal	Net Cash Flow	Cumulative Cash Flow
0	\$22,874	0	0	0	\$0	0	0	(22,874)	0
1	\$0	79,323	\$12,612	\$0	\$27,763	\$30,211	\$6,649	\$3,516	(\$19,358)
2	\$0	78,926	\$12,991	\$0	\$27,624	\$29,731	\$7,129	\$3,755	(\$15,603)
3	\$0	78,531	\$13,380	\$0	\$27,486	\$29,215	\$7,645	\$4,007	(\$11,596)
4	\$0	78,139	\$13,782	\$0	\$27,349	\$28,663	\$8,197	\$4,271	(\$7,326)
5	\$0	77,748	\$14,195	\$801	\$27,212	\$28,070	\$8,790	\$3,747	(\$3,579)
6	\$0	77,359	\$14,621	\$797	\$27,076	\$27,435	\$9,425	\$4,040	\$461
7	\$0	76,972	\$15,060	\$793	\$26,940	\$26,753	\$10,106	\$4,348	\$4,809
8	\$0	76,588	\$15,512	\$789	\$26,806	\$26,023	\$10,837	\$4,669	\$9,478
9	\$0	76,205	\$15,977	\$785	\$26,672	\$25,239	\$11,620	\$5,004	\$14,482
10	\$0	75,824	\$16,456	\$781	\$26,538	\$24,399	\$12,460	\$5,354	\$19,835
11	\$0	75,444	\$16,950	\$777	\$26,406	\$23,498	\$13,361	\$5,719	\$25,554
12	\$0	75,067	\$17,458	\$773	\$26,274	\$22,533	\$14,327	\$6,099	\$31,653
13	\$0	74,692	\$17,982	\$769	\$26,142	\$21,497	\$15,363	\$6,495	\$38,148
14	\$0	74,318	\$18,522	\$765	\$26,011	\$20,386	\$16,473	\$6,908	\$45,056
15	\$0	73,947	\$19,077	\$762	\$25,881	\$19,195	\$17,664	\$7,337	\$52,394
16	\$0	73,577	\$19,650	\$758	\$25,752	\$17,918	\$18,941	\$7,784	\$60,178
17	\$0	73,209	\$20,239	\$754	\$25,623	\$16,549	\$20,311	\$8,249	\$68,426
18	\$0	72,843	\$20,846	\$750	\$25,495	\$15,081	\$21,779	\$8,731	\$77,158
19	\$0	72,479	\$21,472	\$747	\$25,368	\$13,506	\$23,353	\$9,233	\$86,391
20	\$0	72,117	\$22,116	\$743	\$25,241	\$11,818	\$25,041	\$9,754	\$96,145
21	\$0	71,756	\$22,779	\$739	\$25,115	\$10,767	\$23,021	\$13,367	\$109,511
22	\$0	71,397	\$23,463	\$735	\$24,989	\$8,701	\$18,944	\$20,071	\$129,583
23	\$0	71,040	\$24,166	\$732	\$24,864	\$0	\$0	\$48,299	\$177,882
24	\$0	70,685	\$24,891	\$728	\$24,740	\$0	\$0	\$48,903	\$226,785
25	\$0	70,332	\$25,638	\$724	\$24,616	\$0	\$0	\$49,530	\$276,315
Totals:		1,513,308	\$338,897	\$12,343	\$529,658	\$457,720	\$279,473	\$321,437	\$1,492,781
Net Present Value (NPV)							\$60,753		
Internal Rate of Return (IRR)							20.8%		

Project Name: LGEA Solar PV Project - Collingswood Water Treatment Plant							
Location: Collingswood, NJ							
Description: Photovoltaic System - Direct Purchase							
Simple Payback Analysis							
		Photovoltaic System - Direct Purchase					
Total Construction Cost		\$457,470					
Annual kWh Production		79,323					
Annual Energy Cost Reduction		\$12,612					
Annual SREC Revenue		\$27,763					
First Cost Premium		\$457,470					
Simple Payback:		11.33					Years
Life Cycle Cost Analysis							
Analysis Period (years):		25		Financing %:		0%	
Financing Term (mths):		0		Maintenance Escalation Rate:		3.0%	
Average Energy Cost (\$/kWh)		\$0.159		Energy Cost Escalation Rate:		3.0%	
Financing Rate:		0.00%		SREC Value (\$/kWh)		\$0.350	
Period	Additional Cash Outlay	Energy kWh Production	Energy Cost Savings	Additional Maint Costs	SREC Revenue	Net Cash Flow	Cumulative Cash Flow
0	\$457,470	0	0	0	\$0	(457,470)	0
1	\$0	79,323	\$12,612	\$0	\$27,763	\$40,375	(\$417,095)
2	\$0	78,926	\$12,991	\$0	\$27,624	\$40,615	(\$376,480)
3	\$0	78,531	\$13,380	\$0	\$27,486	\$40,866	(\$335,614)
4	\$0	78,139	\$13,782	\$0	\$27,349	\$41,130	(\$294,483)
5	\$0	77,748	\$14,195	\$801	\$27,212	\$40,606	(\$253,877)
6	\$0	77,359	\$14,621	\$797	\$27,076	\$40,900	(\$212,977)
7	\$0	76,972	\$15,060	\$793	\$26,940	\$41,207	(\$171,770)
8	\$0	76,588	\$15,512	\$789	\$26,806	\$41,528	(\$130,242)
9	\$0	76,205	\$15,977	\$785	\$26,672	\$41,864	(\$88,378)
10	\$0	75,824	\$16,456	\$781	\$26,538	\$42,213	(\$46,165)
11	\$0	75,444	\$16,950	\$777	\$26,406	\$42,578	(\$3,586)
12	\$0	75,067	\$17,458	\$773	\$26,274	\$42,959	\$39,372
13	\$0	74,692	\$17,982	\$769	\$26,142	\$43,355	\$82,727
14	\$0	74,318	\$18,522	\$765	\$26,011	\$43,768	\$126,495
15	\$0	73,947	\$19,077	\$762	\$25,881	\$44,197	\$170,692
16	\$0	73,577	\$19,650	\$758	\$25,752	\$44,644	\$215,336
17	\$0	73,209	\$20,239	\$754	\$25,623	\$45,108	\$260,444
18	\$0	72,843	\$20,846	\$750	\$25,495	\$45,591	\$306,035
19	\$0	72,479	\$21,472	\$747	\$25,368	\$46,093	\$352,128
20	\$0	72,117	\$22,116	\$743	\$25,241	\$46,614	\$398,741
21	\$1	71,756	\$22,779	\$739	\$25,115	\$47,155	\$445,896
22	\$2	71,397	\$23,463	\$735	\$24,989	\$47,716	\$493,612
23	\$3	71,040	\$24,166	\$732	\$24,864	\$48,299	\$541,911
24	\$4	70,685	\$24,891	\$728	\$24,740	\$48,903	\$590,814
25	\$5	70,332	\$25,638	\$724	\$24,616	\$49,530	\$640,344
Totals:		1,513,308	\$338,897	\$12,343	\$529,658	\$1,097,814	\$856,211
Net Present Value (NPV)						\$640,369	
Internal Rate of Return (IRR)						7.9%	

Building	Roof Area (sq ft)	Panel	Qty	Panel Sq Ft	Panel Total Sq Ft	Total KW _{DC}	Total Annual kWh	Panel Weight (33 lbs)	W/SQFT
Collingswood - Water Treatment Plant	3600	Sunpower SPR230	221	14.7	3,250	50.83	79,323	7,293	15.64



 . = Proposed PV Layout

Notes:

1. Estimated kWh based on the National Renewable Energy Laboratory PVWatts Version 1 Calculator Program.